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Patent Application

Applicant(s):	Y. Chen et al.
Case:	1-18
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Group:	2828
Examiner:	Cornelius H. Jackson

I hereby certify that this paper is being transmitted on this date via facsimile to Examiner Cornelius H. Jackson of the United States Patent and Trademark Office at (571) 273-1942.

Signature: Lisa L. Vulpis Date: January 10, 2005

Title: System Comprising Optical Semiconductor Waveguide Device

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LETTER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

As per the request of Examiner Jackson, listed below are the pending claims of the above-identified application.

If any additional information is required, please contact the undersigned.

1. (Previously presented) An optical communication system comprising an external cavity laser that comprises:

a gain medium comprising an active region, the gain medium including an antireflective layer to prevent the laser from lasing off facets of the laser, the active region containing a quantum well to generate light, the quantum well having sides and cladding layers formed on the sides;

a tapered beam expanding region, optically coupled to the active region, the beam expanding region and being wider than the active region, the beam expanding region shaped to provide lateral broadening and vertical broadening or both;

one or more optical guiding layers to guide light from the gain media towards the beam expanding region;

an optical waveguide located adjacent the gain medium such that at least a portion of the electromagnetic energy generated by the active region passes through the beam expanding region and through the antireflective layer into the optical waveguide;

a Bragg grating integral with or coupled to the optical waveguide,

wherein the gain medium and the optical waveguide exhibit a coupling efficiency which even without the presence of coupling optics located between the gain medium and the optical waveguide is great enough that during laser operation, substantially all optical resonance that occurs is resonance of the cavity defined between said reflective face and said grating; and

wherein the grating bandwidth is selected such that laser provides multimode output of at least two modes within the grating bandwidth.

2. (Previously presented) The system of claim 1, wherein the coupling efficiency is at least 50% with or without the presence of coupling optics located between the gain medium and the optical waveguide.

3. (Previously presented) The system of claim 1, wherein the cavity has a length of less than 1 cm.

4. (Original) The system of claim 1, wherein the length of the system is less than 100 km.

5. (Original) The system of claim 1, wherein the laser is operated by direct modulation.

6. (Original) The system of claim 1, wherein the bit error rate of the system is less than 10^{-9}.

7. (Original) The system of claim 6, wherein the bit error rate of the system is less than 10^{-12}.

8. (Original) The system of claim 1, wherein the laser is operated at 2.5 GHz or greater.

9. (Original) The system of claim 1, wherein the laser is operated in the absence of a temperature-compensating apparatus.

10. (Original) The system of claim 1, wherein the gain medium and optical waveguide are coupled in the absence of coupling optics.

11. (Presently presented) An optical communication system comprising an external cavity laser that comprises:

a gain medium comprising an active region, the gain medium including an antireflective layer to prevent the laser from lasing off facets of the laser, the active region containing a quantum well that generates light, the quantum well having sides, and two cladding layers formed on the sides of the quantum well;

a tapered beam expanding region, optically coupled to the active region, the beam expanding region and being wider than the active region, the beam expanding region shaped to provide lateral broadening and vertical broadening or both;

one or more optical guiding layers to guide light from the gain media towards the beam expanding region;

an optical waveguide located adjacent the gain medium such that at least a portion of the electromagnetic energy generated by the active region passes through the beam expanding region and through the antireflective layer into the optical waveguide;

a Bragg grating integral with or coupled to the optical waveguide;

wherein the gain medium and the optical waveguide exhibit a coupling efficiency which even without the presence of coupling optics located between the gain medium and the optical waveguide is great enough that during laser operation, substantially all optical resonance that occurs is resonance of the cavity defined between said reflective face and said grating; and

wherein the grating bandwidth is selected such that laser provides multimode output of at least two modes within the grating bandwidth;

wherein the laser is operated by direct modulation;

wherein the laser is operated in the absence of a temperature-compensating apparatus;

wherein the gain medium comprises a cavity less than 1 cm in length;
wherein the grating bandwidth is about 90 GHz or greater; and
wherein the length of the system is less than 100 km.

12. (Previously presented) The system of claim 11, wherein the coupling efficiency is at least 50%.

13. (Original) The system of claim 11, wherein the bit error rate of the system is less than 10^{-9}.

14. (Original) The system of claim 13, wherein the bit error rate of the system is less than 10^{-12}.

15. (Original) The system of claim 13, wherein the laser is operated at 2.5 GHz or greater.

16. (Previously presented) The system of claim 1, wherein the coupling efficiency between the gain medium and the optical waveguide is at least 40%

17. (Previously presented) The system of claim 1, wherein the optical communications system comprises a WDM or DWDM system.

18. (Previously presented) The system of claim 11, wherein the coupling efficiency between the gain medium and the optical waveguide is at least 40%.

19. (Previously presented) The system of claim 11, wherein the optical communications system is a WDM or DWDM system.

20. (Canceled)

21. (Previously presented) A multimode laser as in claim 1, comprising:

a gain medium having a reflective face, a beam-expanding region, and an antireflective (AR) layer;

an optical waveguide located adjacent the gain medium such that at least a portion of light output from the gain region passes through the beam-expanding region and through the AR layer into the optical waveguide; and

a grating defined in the optical waveguide, said grating having a bandwidth;

wherein the gain medium and the optical waveguide exhibit a coupling efficiency which, even without the presence of coupling optics located between the gain medium and the optical waveguide, is great enough that during laser operation, substantially all optical resonance that occurs is resonance of the cavity defined between said reflective face and said grating; and

wherein the laser is configured to provide multimode output of at least two modes within the grating bandwidth.

22. (Previously presented) The multimode laser of claim 17, wherein the light output from the gain region is butt-coupled from the AR layer to a cleaved end of said optical waveguide.

23. (Previously presented) The multimode laser of claim 17, wherein the light output from the gain region is modulated by direct modulation.

Respectfully submitted,

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